

# WORKSHOP SOBRE TECNOLOGIAS DE CAPTURA, ESTOCAGEM E UTILIZAÇÃO DE CO2 EM DIFERENTES FORMAÇÕES (*CARBON CAPTURE, STORAGE AND UTILIZATION (CCUS) TECHNOLOGIES IN DIFFERENT FORMATIONS*)

## POLICIES AND ECONOMICS FOR CCS IN BRAZIL

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Research Centre  
for Gas Innovation

cleaner energy for a sustainable future

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# SUMMARY

**Basic thoughts on CCS Economics**

**Brazilian perspectives**

**Final remarks**



## **Basic thoughts on CCS Economics**

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# Basic thoughts on CCS Economics

## CCS and THE ROLE OF STRUCTURING INFORMATION ON GLOBAL TECHNOLOGICAL DEVELOPMENT

- ❑ The great expectations built around the potential of CCS processes have led to a large number of publications on the subject (particularly the so called ROADMAPS)
- ❑ Several international entities, governments and researchers set out to organize the information produced and enable the identification of trends and progress of CCS on all fronts.

# Basic thoughts on CCS Economics

**YET ... We still have major issues related to INFORMATION:**

- ❑ Categorization of CCS technologies - No consensus in such categorization
- ❑ Identification and description of technologies – Also missing conformity  
Authors don't clearly explain the methods to choose the CASE STUDIES
- ❑ Maturity for implementation - Publications often have kind of scales to classify the maturity, but the methods are completely different.

# Basic thoughts on CCS Economics

## **YET ... We still have major issues related to INFORMATION:**

- ❑ Applications of technologies – Huge variations in the scope of covered cases
- ❑ Assessment of capture potential - Publications usually don't present the potential for carbon capturing of different technology, or show it in very heterogeneous way
- ❑ Confusing information on demonstration projects and pilot plants - Adoption of quite different approach to identify options closer to commercial projects
- ❑ Technological challenges presented in quite general way and do not adequately assess the barriers to further developments

# Basic thoughts on CCS Economics

## **YET ... We still have major issues related to INFORMATION:**

- ❑ Cost evaluation - Publications usually highlight the need to reduce the costs of capturing and storing but usually they don't evaluate values.
- ❑ Cost assessment when is presented don't demonstrate the criteria and reference data
- ❑ Analytical methods based on costs of prevention of CO<sub>2</sub> by emitters or focused on investments and additional costs by sector and by region.

# Basic thoughts on CCS Economics



## **Economics of CCS**

**Jim Watson**  
**Director, Sussex Energy Group**

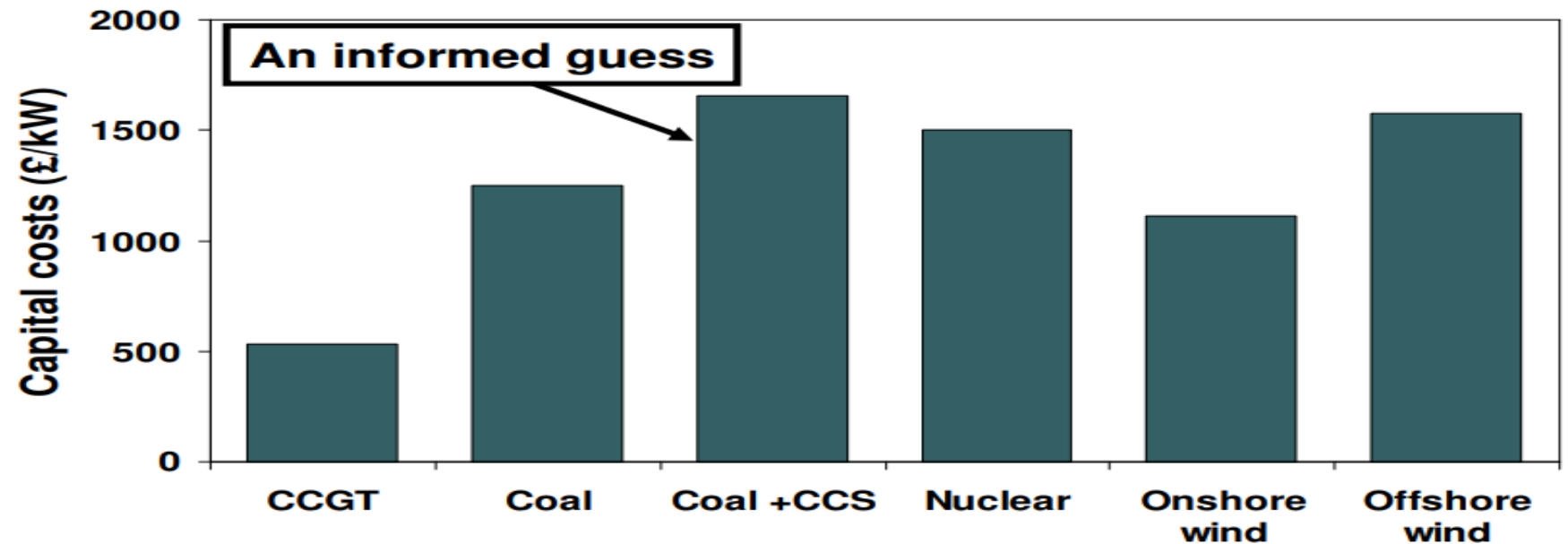
UKCCSC Winter School, 9<sup>th</sup> Feb 2011



# Basic thoughts on CCS Economics

## CCS - HOW EXPENSIVE?

**How do CCS economics compare?**  
Some illustrative figures



Source: Committee on Climate Change, 2009

# Basic thoughts on CCS Economics

## CCS - HOW EXPENSIVE?

**SUCH economic comparisons might be misleading:**

- Give a poor guide to real investment behavior
- Risks are very important to decision too – Investors may favor an option with higher costs if they feel it as having lower risks
- In ENERGY it also matters what other investors are doing ('herd behaviour') (e.g. global adoption of high effic gas fired power plants – See BRAZIL)
- New technologies are subject to “excessive optimism’ by advocates; and ‘excessive pessimism’ by investors

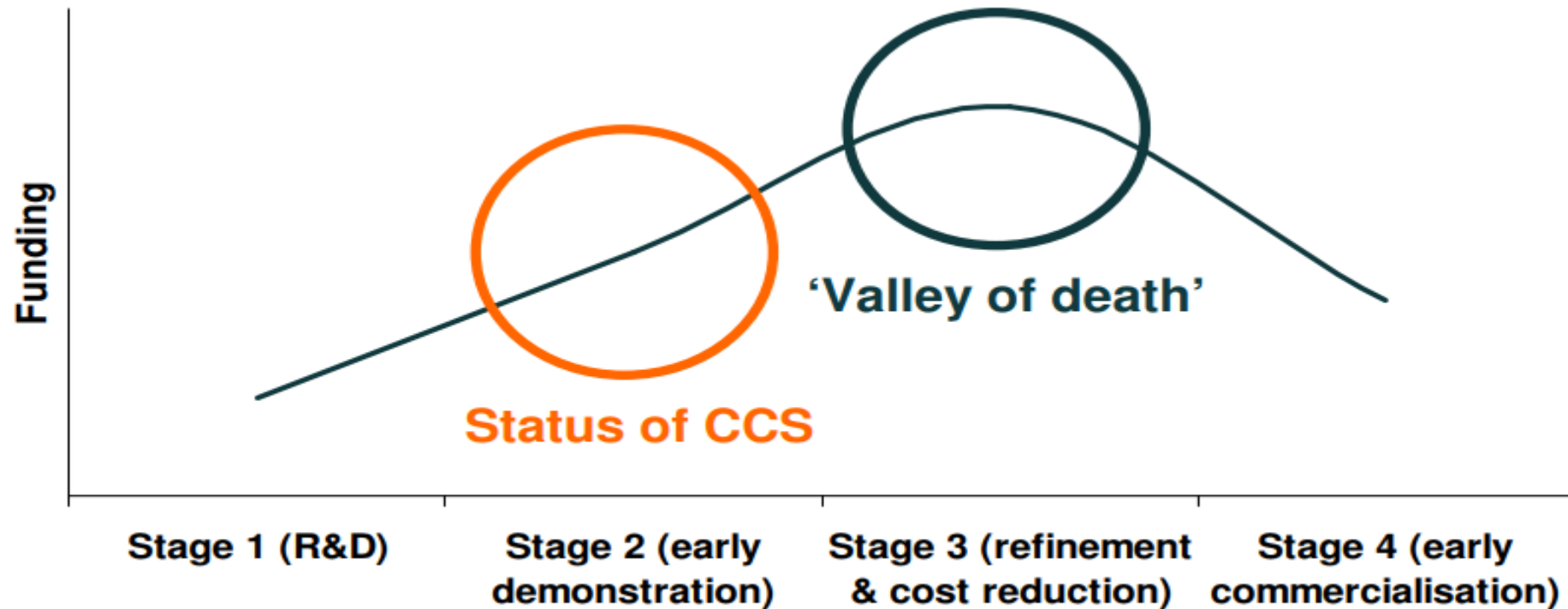
# Basic thoughts on CCS Economics

## CCS - HOW EXPENSIVE?

- **Strong beliefs on theory and evidence from ‘learning curves’:**
- Other experiences suggest that costs should fall with cumulative investment
- But past experiences also shows this isn’t always true
- **Learning process likely to be complex and long:**
- CCS has never been implemented at full scale
- Economics subject to many uncertainties:
  - Capital costs (especially for ‘first of a kind’)
  - Fuel prices, carbon prices, operating efficiency
  - Storage costs and liabilities (linked to legal regime)

# Basic thoughts on CCS Economics

Costs of learning can be substantial



Source: Adapted from Carbon Trust



## **Basic thoughts on CCS Economics**

### **Brazilian perspectives**

## **Final remarks**

# Brazilian perspectives

## WHY SUPPORT CCS IN BRAZIL

### Adapting SPRU's Recommendation given to UK

#### ➤ Diplomatic rationales

- Very green Energy Mix gives leadership to Brazil on climate change debate
- Brazil's global insertion is always through Multilateral Agreements
- Membership in Paris Agreement is major piece of Brazilian diplomacy
- Regional influence and leadership – Particularly with poor neighborhood
- **Present and Future difficulties:** Slow reduction of forest burning; Growing reliance on domestic fossil fuels (particularly NG); No clear exporting market for domestic gas; Growing GAS-TO-GAS competition with Bolivian imports

# Brazilian perspectives

## WHY SUPPORT CCS IN BRAZIL

### Adapting SPRU's Recommendation given to UK

#### ➤ Geological rationale

- Huge short-term and middle-term pressures coming from PRESALT
- Re-injections today will become growing CO<sub>2</sub> production tomorrow
- Foreseeable capital cost increase at PRESALT production (early abandonment of wells and infrastructures)
- Avoiding growing flaring and venting is strategic need to a sustainable PRESALT
- PRESALT creates suitable situation for CO<sub>2</sub> storage (although uncertain, risky, costly and high-tech demanding)
- Brazil might also be well placed for CO<sub>2</sub> storage in both depleted hydrocarbon fields and saline aquifers

# Brazilian perspectives

## WHY SUPPORT CCS IN BRAZIL

### Adapting SPRU's Recommendation given to UK

#### ➤ Economic rationales

- BRAZIL skills, especially in offshore engineering?
- Brazil-based firms may benefit from 'first mover advantage'
- Opportunity costs in PRESALT developments may anticipate decisions
- R&D levy might be instrumental for initial/more risky investments
- Another large-scale option for emissions mitigation.



# Brazilian perspectives

## DIFFICULTIES TO SUPPORT CCS IN BRAZIL

- ❖ Brazilian government will still take a long time to commit to CCS
- ❖ Many years to convince the Treasury to sponsor demonstrations
- ❖ Stuck on historical debate: Cleaner Oil&Gas X More renewables
- ❖ dating back to the 1990s
- ❖ Original plans for one demonstration plant inappropriate for diversity of CCS technologies / multiple uncertainties
- ❖ Required Offshore Coalition of companies to confirm more aggressive plans for a large-scale demonstration unit in the PRESALT
- ❖ A long way to go, and many unanswered questions with respect to all kind of uncertainties.

# Brazilian perspectives

## PUBLIC POLICIES - OPTIONS

- ❖ R&D levies to support geological studies and mapping capture and storage potentials
- ❖ CCS demonstration plant's financial supporting options:
  - ❖ Capital grant from the government (**reduced**)
  - ❖ R&D levy from Oil&Gas production (**available – joint efforts**)
  - ❖ CCS Levy on consumer bills (big industries and power) (**reduced**)  
(also subject to uncertainty for example from Electricity Market Ref.)
  - ❖ R&D levy from Electricity sector (**available – new policies required**)
- ❖ Key question:
  - ❖ what are pros and cons of options with respect to investor risks; lower impact to markets; maximizing spillovers.
  - ❖ Effective incentive for operation – Avoiding the construction of White Elephants

# Brazilian perspectives

## OTHER PUBLIC POLICIES OPTIONS – LOTS OF OPPORTUNITIES

### Regulations

Emissions Performance  
Standard (EPS)

CCS Mandate

CCS Quota Obligation

### Economic incentives

Feed-in Tariff

Capital Grant

Carbon price guarantee



**Basic thoughts on CCS Economics**

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## FINAL REMARKS

- ❖ CCS economics very uncertain due to lack of experience at full scale (Beware of comparisons with more established technologies where risk profiles are different)
- ❖ Economic uncertainties in Brazil are higher particularly on CAPEX trends
- ❖ Process of innovation for CCS likely to be long and costly (How to make technologies choices - unlikely that all variants will survive)
- ❖ Good arguments for Brazil to pursue CCS
  - ✓ But is Brazil competitive and environm. conscious enough to be a leader?
  - ✓ Need to attract private/foreign investment to infrastructure is a barrier?



## FINAL REMARKS

- ❖ Many options for public policy support of CCS with different implications for CCS investors and other markets
- ❖ Evolving regulation on PRESALT offshore production has major implications
- ❖ Electricity Market Reform may also have important implications  
Is Brazil prepared to use fossil-fuel firing power stations more intensively (for base loads)?



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**THANK YOU**

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